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(71) Applicant: **TOSHIBA CORP**

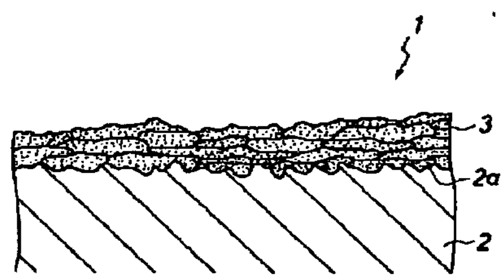
(72) Inventor: **SATO MICHIO**
KOSAKA YASUO

(54) **PARTS FOR VACUUM FILM FORMING DEVICE, VACUUM FILM FORMING DEVICE USING THE SAME, TARGET AND BACKING PLATE**

(57) Abstract:

PROBLEM TO BE SOLVED: To stably and effectively prevent the peeling of a film forming mate rial adhered to parts for a vacuum film forming device, a target and a backing plate in a film forming stage and top prevent the intrusion of particles causing the generation of defects u wiring film or the like.

SOLUTION: This parts 1 for a vacuum film forming device has the main body 2 of the parts and sprayed film 3 formed on the surface of the main body 2 of the parts and in which the gaseous remaining amt. is regulated to $\leq$10 Torr.cc/h. The vacuum film forming device has a holding part for the sample to be film-coated such as a substrate holder arranged in a vacuum vessel, a film forming source such as a target arranged opposite to the holding part for the sample to be film-coated, film forming source holding parts such as a target outer circumference press and a center cap and sticking preventing parts, Among these, at least one selected from among the holding part for the sample to be film-formed, film forming source holding parts and sticking preventing parts is constituted of the above parts for a vacuum film forming device, target and backing plate.



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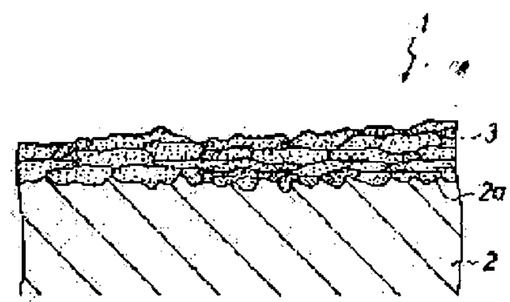
SOLUTION: This parts 1 for a vacuum film forming device has the main body 2 of the parts and sprayed film 3 formed on the surface of the main body 2 of the parts and in which the gaseous remaining amt. is regulated to ≤10 Torr.cc/h. The vacuum film forming device has a holding part for the sample to be film-coated such as a substrate holder arranged in a vacuum vessel, a film forming source such as a target arranged opposite to the holding part for the sample to be film-coated, film forming source holding parts such as a target outer circumference press and a center cap and sticking preventing parts, Among these, at least one selected from among the holding part for the sample to be film-formed, film forming source holding parts and sticking preventing parts is constituted of the above parts for a vacuum film forming device, target and backing plate.



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MEANS

[Means for Solving the Problem] In order that this invention persons may suppress generating of the minute particle by ablation of the affix from the component part, the target, and the back up plate of vacuum membrane-formation equipment as much as possible, as a result of examining many things, the coat which absorbing the internal stress of an affix and reducing stress showed an effect to ablation suppression of an affix, and formed by the spraying process found out having the good stress reduction effect.
[0014] However, since thermal spraying is usually performed in the atmosphere, gas, moisture, etc. are contained in a thermal-spraying film, and the oxide film etc. is generating it in the front face of a thermal-spraying film further. When it is used incorporating the parts which have such a thermal-spraying film in vacuum membrane formation equipment, gas constituents are emitted from parts, a degree of vacuum not only does not go up, but it will originate in discharge, a scaling film, etc. of gas constituents, ablation of an affix will take place, and generating of particle will newly be induced. Moreover, when parts are used in a corrosive atmosphere, the thermal-spraying film itself corrodes and generating of particle is caused. In order to improve such a point, after forming a coat by the spraying process, it found out that it was effective to heat-treat in a vacuum or hydrogen atmosphere, and to carry out degasifying.
[0015] As this invention is accomplished based on knowledge which was mentioned above and the parts for vacuum membrane formation equipments of this invention were indicated to the claim 1, it is the component part of vacuum membrane formation equipment, and is characterized by providing the thermal-spraying film whose amount of gas survival is 10 or less Torr-cc/g by being formed in the front face of the main part of parts, and the aforementioned main part of parts. Moreover, as indicated especially to the claim 3, for the aforementioned thermal-spraying film, surface roughness is the average of roughness height. 5-50 micrometers While being a range, thickness is 50 to 500 micrometer. It is characterized by being a range.
[0016] As indicated to the claim 6, the vacuum membrane formation equipment of this invention Moreover, a vacuum housing, The formed membranes sample attaching part arranged in the aforementioned vacuum housing, and the source of membrane formation which counters with the aforementioned formed membranes sample attaching part in the aforementioned vacuum housing, and is arranged, In the vacuum membrane formation equipment possessing the adhesive protection part article arranged around the source attaching part of membrane formation holding the aforementioned source of membrane formation, and the aforementioned formed membranes sample attaching part or the source attaching part of membrane formation It is being chosen out of the aforementioned formed membranes sample attaching part, the aforementioned source attaching part of membrane formation, and the aforementioned adhesive protection part article that it is few. One is characterized by the bird clapper from the parts for vacuum membrane formation equipments of this invention mentioned above.
[0017] Furthermore, the target of this invention is characterized by providing the thermal-spraying film whose amount of gas survival is 10 or less Torr-cc/g by being formed in the non-erosion field of the main part of a target, and the aforementioned main part of a target, as indicated to the claim 8. Moreover, the back up plate of this invention is characterized by providing the thermal-spraying film whose amount of gas survival is 10 or less Torr-cc/g by being formed in the front face of the back-up-plate main part for holding a target, and the aforementioned back-up-plate main part, as indicated to the claim 9.
[0018]
[Embodiments of the Invention] Hereafter, the operation gestalt of this invention is explained.
[0019] Drawing 1 is the cross section showing the important section composition of 1 operation gestalt of the parts for vacuum membrane formation equipments of this invention. As for the parts 1 for vacuum membrane formation equipments shown in this drawing, the thermal-spraying film 3 is formed in the front face of the main part 2 of parts (base material). In addition, for example, especially the component of the main part 2 of parts is not limited, it can use the general stainless steel material as a component of an equipment component etc. Moreover, as for thermal-spraying film forming face 2a of the main part 2 of parts, it is desirable to make it be by blast processing etc. beforehand so that an anchor effect may be obtained.
[0020] The above-mentioned thermal-spraying film 3 can be formed with the application of various spraying processes, such as a plasma metal spray method, an oxy-fuel-spraying method, and an electric-arc-spraying method, and it is used according to the component of the main part 2 of parts, a configuration or a thermal spray material (coat material), etc., choosing it suitably. Although the thermal-spraying film 3 is excellent in the adhesion force over the main part 2 of parts, when preventing the ablation from the interface of the main part 2 of parts and the thermal-spraying film 3 based on the temperature rise in a membrane formation process etc., it is desirable that the difference of coefficient of thermal expansion with the main part 2 of parts forms the thermal-spraying film 3 by the metallic material below 10x10-6/K.
[0021] Moreover, when preventing ablation by the differential thermal expansion of the membrane formation material (affix)

which adheres on the thermal-spraying film 3, as for the formation material of the thermal-spraying film 3, it is desirable that the differences of coefficient of thermal expansion with membrane formation material are also below 10x10-6/K. When only a relation with membrane formation material is considered, even if the same material as membrane formation material and the film which forms membranes constitute membrane formation material (source of membrane formation) in the case of an alloy film, a compound film, etc. and there are few thermal-spraying films 3 It is desirable to form by one sort of metallic materials. By satisfying such conditions, the ablation based on the differential thermal expansion of the membrane formation material which adhered on the thermal-spraying film 3 can be prevented.

[0022] Such a thermal-spraying film 3 functions as an ablation prevention film of the membrane formation material (affix) adhered and deposited into the membrane formation process. Although membrane formation material adheres and deposits on the front face of the parts 1 for vacuum membrane formation equipments into a membrane formation process, if a bill-of-materials side is in a certain amount of concavo-convex state here, the thickness of this affix is 20-60 micrometers. A grade does not produce ablation. However, if it becomes more than this, the inclination for an affix to exfoliate easily will be accepted. Internal stress acts on an affix, thickness follows on increasing, internal stress becomes large, and ablation of an affix generates this based on the increase in this internal stress. Therefore, in order to prevent ablation of an affix, it is necessary to absorb the internal stress of an affix and to reduce stress. The above-mentioned thermal-spraying film 3 has the operation which absorbs the internal stress of an affix by the internal structure containing much pores etc., and demonstrates the stress reduction effect of a good affix.

[0023] However, in the film front face, the oxide film etc. is generating further the film which only carried out thermal-spraying formation including gas, moisture, etc. Since these become the cause of generating of particle, the fall factor of a membrane life, the fall factor of a degree of vacuum, etc., after forming a coat by thermal spraying, it is desirable to remove the gas which performed [heat-treating in a vacuum and hydrogen atmosphere etc. and] degasifying processing, and was mixed into the coat by thermal spraying in the atmosphere, moisture, etc.

[0024] That is, when the thermal-spraying film 3 mentioned above performs degasifying processing etc. after thermal-spraying formation, the amount of gas survival is made into 10 or less Torr-cc/g. If the amount of gas survival in the thermal-spraying film 3 exceeds 10 Torr-cc/g, it originates in discharge of gas constituents, the corrosion of a thermal-spraying film, etc., and ablation of an affix will take place or ablation of the thermal-spraying film itself etc. will arise further. In other words, according to the thermal-spraying film 3 of 10 or less Torr-cc/g in the amount of gas survival, discharge, corrosion, etc. of gas constituents can be prevented, and since the stress reduction effect mentioned above on it is fully demonstrated, ablation of an affix can be prevented stably and effectively. When the amount of gas survival of the thermal-spraying film 3 acquires a better effect It is desirable to consider as 5 or less Torr-cc/g.

[0025] Here, drawing 2 is stainless steel material (SUS 304). It is the result of measuring the amount of gas evolutions accompanying the heat-treatment of thermal-spraying degasifying parts which performed degasifying processing on the inside of hydrogen, and 1223Kx1h conditions with the thermal-spraying parts which omit degasifying processing, after forming W thermal-spraying film in a front face by thermal spraying in the atmosphere. In addition, a gas-evolution examination is from ordinary temperature to 773K in a specific vacuum. It carried out by checking the value which measured the capacity to which it is emitted while holding the heating back for 1 hour in 1 hour from the fall of the degree of vacuum at the time of heating and maintenance. It turns out that the amount of gas evolutions is reducing sharply the thermal-spraying degasifying parts which performed degasifying processing so that clearly from drawing 2 . In addition, the amount of gas survival said here is from ordinary temperature to 773K in a specific vacuum. The value measured from the fall of the degree of vacuum after heating the total capacity emitted by holding for 1 hour the heating back in 1 hour shall be pointed out. Moreover, although the amount of gas survival of the thermal-spraying film 3 can also be decreased without performing degasifying processing by applying low pressure spraying etc., since the degasifying processing by heat-treatment etc. has the removal effect of a scaling coat etc., it is desirable processing] to carry out after thermal-spraying formation.

[0026] Since the thermal-spraying film front face is being worn by the oxide skin after thermal spraying when using refractory metals, such as W and muo, as a thermal-spraying film 3, as for the heat-treatment as degasifying processing mentioned above, it is desirable to carry out in the reducing atmosphere of the hydrogen middle class, and, thereby, it can remove a scaling coat. When the scaling coat remains, since an affix becomes easy to exfoliate, removing completely is desirable. It follows, for example, as for hydrogen-reduction processing, it is desirable to carry out in a hydrogen air current after evacuation. Moreover, when the component of the main part 2 of parts is stainless steel, as for processing temperature, it is desirable to carry out to about 1073-1373K. There is a possibility that for example, the hydrogen-reduction effect may not fully be acquired for processing temperature less than by 1073K, and, on the other hand, it is 1373K. When it exceeds, there is a possibility that the main part 2 of parts may cause heat deformation etc.

[0027] Moreover, it is desirable to heat-treat in a vacuum, in forming the thermal-spraying film 3 with material which is easy to carry out hydrogen embrittlement, such as Ti and aluminum, and it is the processing temperature in that case. It is desirable to carry out to about 573-773K. As sufficient gas as the processing temperature in this case being less than 573K

300-500°C

[0028] Since the thermal-spraying film 3 has a complicated surface gestalt based on the morphosis, it shows good adhesion to an affix. Especially, the surface roughness of the thermal-spraying film 3 is average-of-roughness-height Ra. 5-50 micrometers When it is a range, the ablation prevention effect of the outstanding affix is acquired. Namely, surface average-of-roughness-height Ra of the thermal-spraying film 3 5 micrometers A possibility that an affix may exfoliate easily that it is the following is large, and, on the other hand, it is 50 micrometers. If it exceeds, the irregularity of thermal-spraying film 3 front face will become large too much, and in order that a hole may remain without an affix adhering to the thermal-spraying film

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to the parts for vacuum membrane formation equipments used for vacuum membrane formation equipments, such as a sputtering system and a CVD system, the vacuum membrane formation equipment using it, a target, and a back up plate.
[0002]
[Description of the Prior Art] In semiconductor parts, liquid crystal parts, etc., various kinds of wiring films and electrodes are formed using the membrane formation methods, such as the sputtering method and CVD. concrete -- a formed membranes substrates top, such as a semiconductor substrate and a glass substrate, -- the sputtering method, CVD, etc. -- applying -- conductive metals, such as aluminum, Ti, Mo, W, and a Mo-W alloy, and MoSi2 and WSi2 etc. -- the thin film of conductive metallic compounds was formed and it uses as a wiring film, an electrode, etc.
[0003] By the way, with vacuum membrane formation equipments used for formation of the above-mentioned wiring film etc., such as a sputtering system and a CVD system, it is not avoided that membrane formation material adheres and deposits into the membrane formation process to an Si substrate and glass-substrate top also at the various parts arranged in equipment. the membrane formation material adhered and deposited on such parts -- membrane formation -- it exfoliates from parts in process -- they are **** and the cause of generating of dust especially When such dust mixes into the film on a membrane formation substrate, poor wiring, such as short-circuit and opening, will be caused after wiring formation, and the fall of the product yield will be caused.
[0004] From such a thing, in conventional vacuum membrane formation equipment, a front face sticks Cu sheet of a concavo-convex form etc. on a bill-of-materials side, and the dust preventive measures of preventing exfoliation of the membrane formation material which adhered by raising the adhesion force of an affix are taken, for example. Moreover, Provisional Publication No. All or a part of component parts of membrane formation equipment are formed in 63 No. -238263 official report with the same material as membrane formation material, and preventing peeling based on the differential thermal expansion of parts and membrane formation material is proposed.
[0005]
[Problem(s) to be Solved by the Invention] Since the method of sticking Cu sheet etc. among the conventional dust preventive measures mentioned above cannot be continuously stuck on the big portion or a part which is changing intricately of configuration change of parts, it cuts Cu sheet and is sticking it on parts by spot welding etc. discontinuously. For this reason, a portion without Cu sheet exists, and a smooth cutting plane is exposed, and since peeling will occur easily if membrane formation material adheres to such a portion, dust cannot fully be prevented.
[0006] Furthermore, since there is a possibility that the spatter of the Cu sheet may be simultaneously carried out by the influence of plasma, and it may be incorporated as an impurity in a film when Cu sheet is applied to the periphery article of the target used as membrane formation material in a sputtering system, there is a fault that Cu sheet is inapplicable to no parts to which it cannot be used around the target used as the source of membrane formation, therefore membrane formation material adheres.
[0007] On the other hand, when forming all or some of membrane formation equipment configuration parts with the same material as membrane formation material and all parts are formed with membrane formation material, the property fall of part intensity etc. is caused and there is a problem of part cost increasing. Moreover, when forming the film of membrane formation material in a bill-of-materials side, there are problems, like the film itself separates depending on the membrane formation method.
[0008] especially, it sets to the latest semiconductor device -- in order to attain high integration, such as 16M, and 64M and 256M, -- wiring width of face 0.5 micrometers further -- 0.3 micrometers as -- narrow-izing extremely is called for Thus, it sets to the wiring which turned narrowly and is a diameter, for example. 0.3 micrometers Poor wiring will be caused even if the microscopic granule child (minute particle) of a grade mixes. Moreover, narrow-ization of wiring width of face is for the densification of wiring density, though natural, and in order to raise manufacture yields, such as a semiconductor device which has such high-density wiring, the yield of particle itself needs to reduce it sharply.
[0009] In such conventional dust preventive measures (particle preventive measures) that were extremely mentioned above to the severe condition, manufacture yields of the present condition, such as a semiconductor device which could not fully respond though the above-mentioned fundamental problem was removed, but was integrated highly, are very low.

[0010] Moreover, in order to reduce the amount of gas evolutions from parts, forming thermal-spraying films, such as aluminum, in a bill-of-materials side is indicated by JP,61-87861,A. Thermal-spraying films, such as this aluminum, not only have not aimed at generating prevention of particle etc., but though a mere thermal-spraying film is used as generating preventive measures of particle, sufficient effect is not acquired, but it has further the fault that a mere thermal-spraying film tends to exfoliate for a short period of time.

[0011] Furthermore, also in the back up plate for carrying out cooling maintenance of the target which is sources of membrane formation, such as for example, not only membrane formation equipment configuration parts but the sputtering method, or this target, the same problem as the above-mentioned membrane formation equipment configuration parts has generated the above problems.

[0012] The parts for vacuum membrane formation equipments which made it possible to prevent stably and effectively exfoliation of the membrane formation material which was made in order that this invention might cope with such a technical problem, and adheres into a membrane formation process, Mixing of a target and a back up plate, the dust that causes poor generating further, such as a wiring film, or particle is prevented. It aims at offering the vacuum membrane formation equipment, target, and back up plate aiming at the correspondence to the wiring film formation for semiconductor devices integrated highly.

[0013]

[Means for Solving the Problem] In order that this invention persons may suppress generating of the minute particle by exfoliation of the affix from the component part, the target, and the back up plate of vacuum membrane-formation equipment as much as possible, as a result of examining many things, the coat which absorbing the internal stress of an affix and reducing stress showed the effect to exfoliation suppression of an affix, and formed by the spraying process found out having the good stress reduction effect.

[0014] However, since thermal spraying is usually performed in the atmosphere, gas, moisture, etc. are contained in a thermal-spraying film, and the oxide film etc. is generating it in the front face of a thermal-spraying film further. When it is used incorporating the parts which have such a thermal-spraying film in vacuum membrane formation equipment, gas constituents are emitted from parts, a degree of vacuum not only does not go up, but it will originate in discharge, a scaling film, etc. of gas constituents, exfoliation of an affix will take place, and generating of particle will newly be induced. Moreover, when parts are used in a corrosive atmosphere, the thermal-spraying film itself corrodes and generating of particle is caused. In order to improve such a point, after forming a coat by the spraying process, it found out that it was effective to heat-treat in a vacuum or hydrogen atmosphere, and to carry out degasifying.

[0015] As this invention is accomplished based on knowledge which was mentioned above and the parts for vacuum membrane formation equipments of this invention were indicated to the claim 1, it is the component part of vacuum membrane formation equipment, and is characterized by providing the thermal-spraying film whose amount of gas survival is 10 or less Torr-cc/g by being formed in the front face of the main part of parts, and the aforementioned main part of parts. Moreover, as indicated especially to the claim 3, for the aforementioned thermal-spraying film, surface roughness is the average of roughness height. 5-50 micrometers While being a range, thickness is 50 to 500 micrometer. It is characterized by being a range.

[0016] As indicated to the claim 6, the vacuum membrane formation equipment of this invention Moreover, a vacuum housing, The formed membranes sample attaching part arranged in the aforementioned vacuum housing, and the source of membrane formation which counters with the aforementioned formed membranes sample attaching part in the aforementioned vacuum housing, and is arranged, In the vacuum membrane formation equipment possessing the adhesive protection part article arranged around the source attaching part of membrane formation holding the aforementioned source of membrane formation, and the aforementioned formed membranes sample attaching part or the source attaching part of membrane formation It is being chosen out of the aforementioned formed membranes sample attaching part, the aforementioned source attaching part of membrane formation, and the aforementioned adhesive protection part article that it is few. One is characterized by the bird clapper from the parts for vacuum membrane formation equipments of this invention mentioned above.

[0017] Furthermore, the target of this invention is characterized by providing the thermal-spraying film whose amount of gas survival is 10 or less Torr-cc/g by being formed in the non-erosion field of the main part of a target, and the aforementioned main part of a target, as indicated to the claim 8. Moreover, the back up plate of this invention is characterized by providing the thermal-spraying film whose amount of gas survival is 10 or less Torr-cc/g by being formed in the front face of the back-up-plate main part for holding a target, and the aforementioned back-up-plate main part, as indicated to the claim 9.

[0018]

[Embodiments of the Invention] Hereafter, the operation form of this invention is explained.

[0019] Drawing 1 is the cross section showing the important section composition of 1 operation form of the parts for vacuum membrane formation equipments of this invention. As for the parts 1 for vacuum membrane formation equipments shown in this drawing, the thermal-spraying film 3 is formed in the front face of the main part 2 of parts (base material). In addition, for example, especially the component of the main part 2 of parts is not limited, it can use the general stainless steel material as a component of an equipment component etc. Moreover, as for thermal-spraying film forming face 2a of the main part 2 of parts, it is desirable to make it be by blast processing etc. beforehand so that an anchor effect may be obtained.

[0020] The above-mentioned thermal-spraying film 3 can be formed with the application of various spraying processes, such as a plasma metal spray method, an oxy-fuel-spraying method, and an electric-arc-spraying method, and it is used according to the component of the main part 2 of parts, a configuration or a thermal spray material (coat material), etc., choosing it suitably. Although the thermal-spraying film 3 is excellent in the adhesion force over the main part 2 of parts, when preventing the

exfoliation from the interface of the main part 2 of parts and the thermal-spraying film 3 based on the temperature rise in a membrane formation process etc., it is desirable that the difference of coefficient of thermal expansion with the main part 2 of parts forms the thermal-spraying film 3 by the metallic material ~~below 10x10-6/K.~~

[0021] Moreover, when preventing exfoliation by the differential thermal expansion of the membrane formation material (affix) which adheres on the thermal-spraying film 3, as for the formation material of the thermal-spraying film 3, it is desirable that the differences of coefficient of thermal expansion with membrane formation material are also below 10x10-6/K. When only a relation with membrane formation material is considered, even if the same material as membrane formation material and the film which forms membranes constitute membrane formation material (source of membrane formation) in the case of an alloy film, a compound film, etc. and there are few thermal-spraying films 3 It is desirable to form by one sort of metallic materials. By satisfying such conditions, the exfoliation based on the differential thermal expansion of the membrane formation material which adhered on the thermal-spraying film 3 can be prevented.

[0022] Such a thermal-spraying film 3 functions as an exfoliation prevention film of the membrane formation material (affix) adhered and deposited into the membrane formation process. Although membrane formation material adheres and deposits on the front face of the parts 1 for vacuum membrane formation equipments into a membrane formation process, if a bill-of-materials side is in a certain amount of concavo-convex state here, the thickness of this affix is 20-60 micrometers. A grade does not produce exfoliation. However, if it becomes more than this, the inclination for an affix to exfoliate easily will be accepted. Internal stress acts on an affix, thickness follows on increasing, internal stress becomes large, and exfoliation of an affix generates this based on the increase in this internal stress. Therefore, in order to prevent exfoliation of an affix, it is necessary to absorb the internal stress of an affix and to reduce stress. The above-mentioned thermal-spraying film 3 has the operation which absorbs the internal stress of an affix by the internal structure containing much pores etc., and demonstrates the stress reduction effect of a good affix.

[0023] However, in the film front face, the oxide film etc. is generating further the film which only carried out thermal-spraying formation including gas, moisture, etc. Since these become the cause of generating of particle, the fall factor of a membrane life, the fall factor of a degree of vacuum, etc., after forming a coat by thermal spraying, it is desirable to remove the gas which performed [heat-treating in a vacuum and hydrogen atmosphere etc. and] degasifying processing, and was mixed into the coat by thermal spraying in the atmosphere, moisture, etc.

[0024] That is, when the thermal-spraying film 3 mentioned above performs degasifying processing etc. after thermal-spraying formation, the amount of gas survival is made into 10 or less Torr-cc/g. If the amount of gas survival in the thermal-spraying film 3 exceeds 10 Torr-cc/g, it originates in discharge of gas constituents, the corrosion of a thermal-spraying film, etc., and ablation of an affix will take place or ablation of the thermal-spraying film itself etc. will arise further. In other words, according to the thermal-spraying film 3 of 10 or less Torr-cc/g in the amount of gas survival, discharge, corrosion, etc. of gas constituents can be prevented, and since the stress reduction effect mentioned above on it is fully demonstrated, ablation of an affix can be prevented stably and effectively. When the amount of gas survival of the thermal-spraying film 3 acquires a better effect It is desirable to consider as 5 or less Torr-cc/g.

[0025] Here, drawing 2 is stainless steel material (SUS 304). It is the result of measuring the amount of gas evolutions accompanying the heat-treatment of thermal-spraying degasifying parts which performed degasifying processing on the inside of hydrogen, and 1223Kx1h conditions with the thermal-spraying parts which omit degasifying processing, after forming W thermal-spraying film in a front face by thermal spraying in the atmosphere. In addition, a gas-evolution examination is from ordinary temperature to 773K in a specific vacuum. It carried out by checking the value which measured the capacity to which it is emitted while holding the heating back for 1 hour in 1 hour from the fall of the degree of vacuum at the time of heating and maintenance. It turns out that the amount of gas evolutions is reducing sharply the thermal-spraying degasifying parts which performed degasifying processing so that clearly from drawing 2 . In addition, the amount of gas survival said here is from ordinary temperature to 773K in a specific vacuum. The value measured from the fall of the degree of vacuum after heating the total capacity emitted by holding for 1 hour the heating back in 1 hour shall be pointed out. Moreover, although the amount of gas survival of the thermal-spraying film 3 can also be decreased without performing degasifying processing by applying low pressure spraying etc., since the degasifying processing by heat-treatment etc. has the removal effect of a scaling coat etc., it is desirable processing] to carry out after thermal-spraying formation.

[0026] Since the thermal-spraying film front face is being worn by the oxide skin after thermal spraying when using refractory metals, such as W and muo, as a thermal-spraying film 3, as for the heat-treatment as degasifying processing mentioned above, it is desirable to carry out in the reducing atmosphere of the hydrogen middle class, and, thereby, it can remove a scaling coat. When the scaling coat remains, since an affix becomes easy to exfoliate, removing completely is desirable. It follows, for example, as for hydrogen-reduction processing, it is desirable to carry out in a hydrogen air current after evacuation. Moreover, when the component of the main part 2 of parts is stainless steel, as for processing temperature, it is desirable to carry out to about 1073-1373K. There is a possibility that for example, the hydrogen-reduction effect may not fully be acquired for processing temperature less than by 1073K, and, on the other hand, it is 1373K. When it exceeds, there is a possibility that the main part 2 of parts may cause heat deformation etc.

[0027] Moreover, it is desirable to heat-treat in a vacuum, in forming the thermal-spraying film 3 with material which is easy to carry out hydrogen embrittlement, such as Ti and aluminum, and it is the processing temperature in that case. It is desirable to carry out to about 573-773K.

3 whole, there is a possibility that ablation of an affix may take place with there [as the starting point]. The surface roughness of the thermal-spraying film 3 is 10-15 micrometers at the average of roughness height. Considering as the range is still more desirable.

[0029] moreover, the thickness of such [that it is important to adjust the thickness of the thermal-spraying film 3 moderately with the surface roughness mentioned above when acquiring the ablation prevention effect of the affix by the thermal-spraying film 3, and] a point to the thermal-spraying film 3 -- 50 to 500 micrometer What is considered as the range is desirable. that is, the thermal-spraying film 3 reduces the internal stress of an affix, as mentioned above -- although it has the effect -- this stress reduction effect -- thickness -- the extent -- differing -- the thickness of the thermal-spraying film 3 -- 50 micrometers The above-mentioned stress reduction effect falls that it is the following, and an affix becomes easy to separate. On the other hand, it is 500 micrometer. If it exceeds, big internal stress will occur in thermal-spraying film 3 the very thing, and the internal stress of an affix joins this and it becomes easy to generate ablation. The effect which the thickness of the thermal-spraying film 3 described above is acquired more by fitness. 100-300 micrometers Considering as the range is still more desirable.

[0030] The thermal-spraying film 3 consists not only of the coat by single material but of a material different, for example. The thermal-spraying film 3 may consist of coats more than two-layer. Composition which forms the 1st thermal-spraying film with high adhesion in the part to which the thermal-spraying films 3 from which a part shape changes a lot, for example, such as a flection and a bend, tend to separate as concrete composition of the thermal-spraying film 3 more than two-layer to the main part 2 of parts beforehand, and forms the 2nd [to an affix] thermal-spraying film with high adhesion on it, or the composition which forms the thermal-spraying film excellent in corrosion resistance in a front-face side is mentioned. Furthermore, when the differential thermal expansions of the main part 2 of parts and membrane formation material differ extremely, coefficient of thermal expansion differs so that these differential thermal expansions may be eased. You may form the thermal-spraying film more than two-layer in order. When applying the thermal-spraying film 3 more than two-layer, as for the differential thermal expansion between them, it is desirable to carry out to below 10x10-6/K like the differential thermal expansion of the thermal-spraying film 3, and the main part 2 of parts and membrane formation material.

[0031] The parts for vacuum membrane formation equipments of this invention which was mentioned above are used as a component part of vacuum membrane formation equipments, such as a sputtering system and a CVD system, and if it is the parts with which membrane formation material adheres into a membrane formation process, they are applicable to various parts. The operation gestalt of following vacuum membrane formation equipment explains concrete composition.

[0032] Moreover, in explanation of the operation gestalt of the above-mentioned invention, although the parts for vacuum membrane formation equipments were explained The target possessing the thermal-spraying film whose amount of gas survival by which the above-mentioned content was formed in the non-erosion field of the main part of a target and this main part of a target is 10 or less Torr-cc/g, Or the amount of gas survival formed in the front face of the back-up-plate main part for holding a target and this back-up-plate main part can apply similarly in the back up plate possessing the thermal-spraying film which is 10 or less Torr-cc/g. namely, the amount of gas survival of the thermal-spraying film explained with the above-mentioned parts for vacuum membrane formation equipments, coefficient of thermal expansion, the conditions of degasifying processing, surface roughness, and thickness -- and -- The composition more than two-layer is formed in the non-erosion field of the main part of a target, or can apply a target similarly in the thermal-spraying film which is formed in the front face of the back-up-plate main part for carrying out cooling maintenance and whose amount of gas survival is 10 or less Torr-cc/g.

[0033] Next, the operation gestalt of the vacuum membrane formation equipment of this invention is explained. Drawing 3 is drawing showing the important section composition of 1 operation gestalt which applied the vacuum membrane formation equipment of this invention to the sputtering system, 11 is the target fixed to the back up plate 12, and the target 11 which is this source of membrane formation is held by ring-like the target periphery presser foot 13 and center cap 14 which function as a source attaching part of membrane formation. Moreover, the ground shield 15 is formed in the method of a periphery subordinate of a target 11, and up ****** 16 is arranged at the lower part periphery section side.

[0034] The substrate 17 which is a sample formed membranes is held by the platen ring 18 and the substrate electrode holder 19 which are a formed membranes sample attaching part so that opposite arrangement may be carried out with a target 11. Lower ****** 20 is arranged at the periphery section side of the substrate electrode holder 19. These are arranged in the vacuum housing which omitted illustration, and the gas supply system (not shown) for introducing spatter gas and the exhaust air system (not shown) which exhausts the inside of a vacuum housing to a predetermined vacua are connected to the vacuum housing. In addition, 21 in drawing is a magnetic field coil. In the sputtering system of this operation gestalt, it constitutes from parts 1 for vacuum membrane formation equipments of this invention which mentioned above the target periphery presser foot 13, the ground shield 15, the platen ring 18, and the substrate electrode holder 19, i.e., the parts for vacuum membrane formation equipments with which the thermal-spraying film 3 of 10 or less Torr-cc/g was formed for the amount of gas survival on the front face. The concrete composition of the parts 1 for vacuum membrane formation equipments is as having mentioned above. Moreover, in this operation gestalt, it is that by which the amount of gas survival formed the thermal-spraying film 3 of 10 or less Torr-cc/g in the non-erosion field of a target 11, and the front face of a back up plate 12, and the target 11 and the back up plate 12 are constituted. The composition of a target 11 and a back up plate 12 is as having mentioned above. In addition, the thermal-spraying film 3 is formed in the field where the particle by which the spatter was carried out from the target 11 adheres.

[0035] In such a sputtering system, although the membrane formation material (target 11) by which the spatter was carried out into the membrane formation process on the front face of the target periphery presser foot 13, the ground shield 15, the platen ring 18, the substrate electrode holder 19, a target 11, and back-up-plate 12 grade adheres, ablation of this affix is prevented stably

and effectively by the thermal-spraying film 3 of a bill-of-materials side. Moreover, thermal-spraying film 3 the very thing is also stable, and long lasting. By these, dust and the yield of particle, and the amount of mixing to the inside of the film further formed in a substrate 17 can be suppressed sharply. Therefore, the wiring film of a highly-integrated semiconductor device, such as 16M, and 64M and 256M, i.e., wiring width of face, 0.5 micrometers Since mixing of minute particle (for example, diameter 0.2 micrometers above) can be sharply suppressed even if it is the wiring film which forms a high-density wiring network narrowly like the following, it becomes possible to reduce poor wiring sharply.
[0036] In addition, in the above-mentioned operation gestalt, although the example which constituted the target periphery presser foot 13, the ground shield 15, the platen ring 18, the substrate electrode holder 19, the target 11, and the back up plate 12 from this invention was explained, it is also effective to constitute a center cap 14, up ****** 16, and lower ****** 20 grade from parts for vacuum membrane formation equipments of this invention in addition to these. Furthermore, if it is the parts with which adhesion of membrane formation material is not avoided in a membrane formation process about any parts other than these, the parts for vacuum membrane formation equipments of this invention will function effectively. Thus, the vacuum membrane formation equipment of this invention is that it is few as being chosen out of a formed membranes sample attaching part, the source attaching part of membrane formation, an adhesive protection part article, etc. An outstanding effect which was mentioned above can be acquired by applying this invention to a target or a back up plate further by constituting one from parts for vacuum membrane formation equipments of this invention.
[0037] The thermal-spraying film in the parts for vacuum membrane formation equipments of this invention specifically functions effectively also to a target except equipment configuration parts, as mentioned above. That is, the particle by which the spatter of the periphery portion of a target was not carried out substantially, but the spatter was carried out also to such a non-erosion field adheres. Even if the affix of such the target periphery section exfoliates, it becomes the poor cause of a wiring film etc. like ablation of the affix from other parts. Therefore, the poor wiring accompanying ablation of an affix can be prevented by forming the thermal-spraying film by this invention in the non-erosion field of the target by which a spatter is not carried out substantially beforehand.
[0038] Moreover, although the above-mentioned operation gestalt explained the example which applied the vacuum membrane formation equipment of this invention to the sputtering system, it can apply also to vacuum membrane formation equipments, such as a vacuum evaporation system (ion plating, laser ablation, etc. are included) and a CVD system, in addition to this, and the same effect as the sputtering system mentioned above can be acquired.

[Translation done.]

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EXAMPLE

[Example] Next, the concrete example of this invention is explained.
[0040] It is thickness with a plasma metal spray method to the front face of the base material made from SUS 304 as the target periphery presser foot 13, the ground shield 15, the platen ring 18, the substrate electrode holder 19, up ****** 16, and lower ****** 20 of the sputtering system shown in example 1 drawing 3 . 200 micrometers After forming Ti thermal-spraying film 3, the parts which performed heat-treatment of 576Kx1h, and carried out degasifying processing in the vacuum were used, and the magnetron sputtering system was constituted. the amount of gas survival in Ti thermal-spraying film after degasifying processing 0.9 Torr-cc/g -- it is -- moreover, the surface roughness of Ti thermal-spraying film -- average-of-roughness-height Ra 12 micrometers it was .
[0041] a high grade Ti target is set in this magnetron sputtering system, and magnetron sputtering is performed -- a 6 inch wafer top -- Ti and N2 The TiN thin film was formed by introduction of gas. Thus, diameter on the obtained TiN thin film 0.3 micrometers The above number of particle (dust) was measured. Such operation was performed continuously and change of the number of particle was investigated. The result is shown in drawing 4 .
[0042] Moreover, it is thickness with a plasma metal spray method to the front face of the base material made from SUS 304 as the same each part article as the above-mentioned example as an example of comparison with this invention. 200 micrometers Ti thermal-spraying film was formed, this was used as parts, without carrying out degasifying processing, and the magnetron sputtering system was constituted. When evacuation of this magnetron sputtering system was carried out, the discharge capacity from parts changed into the state where many sputtering cannot be carried out, and it reached to the degree of vacuum which can perform sputtering only after bakes a chamber for a long time. Next, change of the number of particle on a TiN thin film was investigated like the above-mentioned example 1. The result is combined with drawing 4 and shown.
[0043] There are the beginning to particle yields [many] at the magnetron sputtering system a particle yield is stabilized up to 2000 charges, and according to the example 1 of comparison to few one, and the magnetron sputtering system according to an example 1 so that clearly from drawing 4 is a further. The increase in the particle which originated in peeling of Ti thermal-spraying film by the 800 charge grade was accepted. From these, in generating of particle, it was stabilized and it was checked by processing of an example effective and that it can prevent.
[0044] As the target periphery presser foot 13, the ground shield 15, the platen ring 18, the substrate electrode holder 19, up ****** 16, and lower ****** 20 of the sputtering system shown in example 2 drawing 3 To the front face of the base material made from SUS 304, it is 50 micrometers in thickness with a plasma metal spray method first. A nickel-Ti alloy thermal-spraying film is formed. Then, thickness 150 micrometers After forming Ti thermal-spraying film, the magnetron sputtering system was constituted using the parts which performed heat-treatment of 573Kx1h and which carried out degasifying processing in the vacuum. the amount of gas survival in the thermal-spraying film after degasifying processing 1 Torr-cc/g -- it is -- moreover, the surface roughness of Ti thermal-spraying film on the front face of the maximum -- the average of roughness height -- 15 micrometers it was .
[0045] The high grade Ti target was set in this magnetron sputtering system, magnetron sputtering was performed, and change of the number of particle (dust) was investigated like the example 1. Consequently, like an example 1, to a 2000 charge grade, are stabilized and there were few particle yields. Moreover, in processing of this example 2, the stability of the thermal-spraying film to a flection etc. was also high, and peeling by such portion was not generated, either, but the very good result was obtained.
[0046] It is thickness with a plasma metal spray method to the front face of the base material made from SUS 304 as the target periphery presser foot 13, the ground shield 15, the platen ring 18, the substrate electrode holder 19, up ****** 16, and lower ****** 20 of the sputtering system shown in example 3 drawing 3 . 200 micrometers In the inside of hydrogen after forming W thermal-spraying film The magnetron sputtering system was constituted using the parts which performed heat-treatment of 1273Kx1h, and carried out degasifying processing. the amount of gas survival in W thermal-spraying film after degasifying processing 2.6 Torr-cc/g -- it is -- moreover -- the front face of W thermal-spraying film -- an oxide skin -- not existing -- the surface roughness -- the average of roughness height 8 micrometers it was .
[0047] The Mo-W target was set in this magnetron sputtering system, magnetron sputtering was performed, and change of the number of particle (dust) was investigated like the example 1. Consequently, to a 1500 charge grade, are stabilized and there were few particle yields. Moreover, when W thermal-spraying parts (example 2 of comparison) in which the yield itself has not carried out degasifying processing are used, it compares. It was about 1/3.
[0048] It is thickness with an electric-arc-spraying method to the front face of the base material made from SUS 304 as the target

periphery presser foot 13, the ground shield 15, the platen ring 18, the substrate electrode holder 19, up ****** 16, and lower ****** 20 of the sputtering system shown in example 4 drawing 3 . 250 micrometers After forming aluminum thermal-spraying film, the magnetron sputtering system was constituted using the parts which performed heat-treatment of 623Kx1h, and carried out degasifying processing in the vacuum. the amount of gas survival in aluminum thermal-spraying film after degasifying processing 3.2 Torr-cc/g -- it is -- moreover, the surface roughness of aluminum thermal-spraying film -- the average of roughness height -- 25 micrometers it was .

[0049] The high grade tungsten silicide (WSi2.8) target was set in this magnetron sputtering system, magnetron sputtering was performed, and change of the number of particle (dust) was investigated like the example 1. Consequently, like an example 1, to a 2000 charge grade, are stabilized and there were few particle yields. Moreover, when aluminum thermal-spraying parts (example 3 of comparison) in which the yield itself has not carried out degasifying processing are used, it compares. It was about 1/2.

[0050] It is 20 micrometers in thickness at CVD to the front face of the base material made from SUS 304 as the target periphery presser foot 13, the ground shield 15, the platen ring 18, the substrate electrode holder 19, up ****** 16, and lower ****** 20 of the sputtering system shown in example of comparison 4 drawing 3 . After forming W film (example 4 of comparison), the magnetron sputtering system was constituted using the parts which heat-treated 773Kx 1hr, and carried out degasifying processing in the vacuum. the surface roughness of W film -- the average of roughness height 0.5 micrometers it was .

[0051] When the high grade tungsten silicide (WSi2.8) target was set in this magnetron sputtering system, magnetron sputtering was performed and change of the number of particle (dust) was investigated like the example 1, ablation of the tungsten silicide film of a bill-of-materials side arose in 35 charge grade, and the number of particle (dust) increased sharply.

[0052] It is thickness with a plasma metal spray method to the front face of the base material made from SUS 304 as the target periphery presser foot 13, the ground shield 15, the platen ring 18, the substrate electrode holder 19, up ****** 16, and lower ****** 20 of the sputtering system shown in example 5 drawing 3 . 250 micrometers Ti thermal-spraying film was formed. Moreover, a high grade Ti is used as a target 11, and Cu is used for a back up plate 12, and it is thickness with a plasma metal spray method similarly to the front face of the non-erosion field of the periphery section of this high grade Ti target 11, and the Cu back up plate 12. 250 micrometers Ti thermal-spraying film was formed.

[0053] Heat-treatment of 575Kx1h was performed in the vacuum, degasifying processing of each part article, the target, and the back up plate in which these Ti thermal-spraying film was formed was carried out, and the magnetron sputtering system, the target, and the back up plate were constituted using these things that carried out degasifying processing. the amount of gas survival in Ti thermal-spraying film after degasifying processing 1.2 Torr-cc/g -- it is -- moreover, the surface roughness of Ti thermal-spraying film -- the average of roughness height -- 17 micrometers it was .

[0054] After setting the high grade Ti target 11 held at the above-mentioned Cu back up plate 12 at the above-mentioned magnetron sputtering system, magnetron sputtering was performed and change of the number of particle (dust) was investigated like the example 1. Consequently, the particle generated suddenly was lost as compared with the case where thermal spraying is not carried out to a target and a back up plate, the whole number of particle was reduced by half, it was stabilized and effective and that it can prevent have checked particle generating.

[Translation done.]

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CLAIMS

[Claim(s)]
[Claim 1] The parts for vacuum membrane formation equipments which are component parts of vacuum membrane formation equipment, are formed in the front face of the main part of parts, and the aforementioned main part of parts, and are characterized by providing the thermal-spraying film whose amount of gas survival is 10 or less Torr-cc/g.
[Claim 2] They are the parts for vacuum membrane formation equipments characterized by performing degasifying processing after thermal-spraying formation in the part for vacuum membrane formation equipments according to claim 1, as for the aforementioned thermal-spraying film.
[Claim 3] It sets on the parts for vacuum membrane formation equipments according to claim 1, and, for the aforementioned thermal-spraying film, surface roughness is the average of roughness height. 5-50 micrometers While being a range, thickness is 50 to 500 micrometer. Parts for vacuum membrane formation equipments characterized by being a range.
[Claim 4] The aforementioned thermal-spraying film consists of a different material in the part for vacuum membrane formation equipments according to claim 1. Parts for vacuum membrane formation equipments characterized by having a coat more than two-layer.
[Claim 5] They are the parts for vacuum membrane formation equipments with which, as for the aforementioned thermal-spraying film, the difference of coefficient of thermal expansion with the aforementioned main part of parts is characterized by the bird clapper from the metallic material below 10x10-6/K in the part for vacuum membrane formation equipments according to claim 1.
[Claim 6] Vacuum housing. The formed membranes sample attaching part arranged in the aforementioned vacuum housing. The source of membrane formation which counters with the aforementioned formed membranes sample attaching part in the aforementioned vacuum housing, and is arranged. The source attaching part of membrane formation holding the aforementioned source of membrane formation. The adhesive protection part article arranged around the aforementioned formed membranes sample attaching part or the source attaching part of membrane formation. It is being vacuum membrane formation equipment equipped with the above, and being chosen out of the aforementioned formed membranes sample attaching part, the aforementioned source attaching part of membrane formation, and the aforementioned adhesive protection part article that it is few. One is characterized by the bird clapper from the part for vacuum membrane formation equipments according to claim 1.
[Claim 7] Even if few [constitute / the thermal-spraying film formed in the front face of the aforementioned parts for vacuum membrane formation equipments / the aforementioned source of membrane formation and] in vacuum membrane formation equipment according to claim 6 Vacuum membrane formation equipment characterized by the bird clapper from one sort of metallic materials.
[Claim 8] The target which is formed in the non-erosion field of the main part of a target, and the aforementioned main part of a target, and is characterized by providing the thermal-spraying film whose amount of gas survival is 10 or less Torr-cc/g.
[Claim 9] The back up plate which is formed in the front face of the back-up-plate main part for holding a target, and the aforementioned back-up-plate main part, and is characterized by providing the thermal-spraying film whose amount of gas survival is 10 or less Torr-cc/g.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the cross section showing the important section composition of the parts for vacuum membrane formation equipments by 1 operation gestalt of this invention.
[Drawing 2] It is drawing showing the amount of gas evolutions under heating of the parts for vacuum membrane formation equipments of this invention as compared with the thermal-spraying parts and part material which have not performed degasifying processing.
[Drawing 3] It is the cross section showing the important section composition of 1 operation gestalt of the sputtering system which applied the vacuum membrane formation equipment of this invention.
[Drawing 4] It is drawing shown as compared with the sputtering system using the thermal-spraying parts which has not changed the number of particle at the time of using the sputtering system by the example 1 of this invention in degasifying processing.
[Description of Notations]
1 ...... Parts for vacuum membrane formation equipments
2 ...... Main part of parts (base material)
3 ...... Thermal-spraying film
11 .... Target
12 .... Back up plate
13 .... Target periphery presser foot
14 .... Center cap
15 .... Ground shield
16 20 .... ******
17 .... Substrate formed membranes
18 .... Platen ring
19 .... Substrate electrode holder

[Translation done.]

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(71)出願人　000003078
株式会社東芝
神奈川県川崎市幸区堀川町72番地

(72)発明者　佐藤　道雄
神奈川県横浜市磯子区新杉田町８番地　株式会社東芝横浜事業所内

(72)発明者　高阪　泰郎
神奈川県横浜市磯子区新杉田町８番地　株式会社東芝横浜事業所内

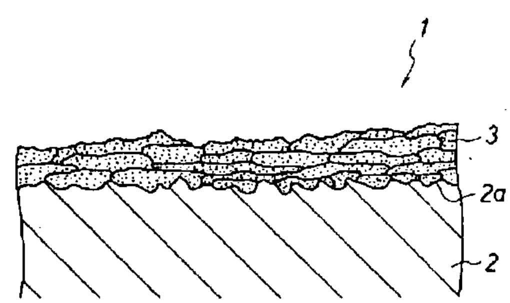
(74)代理人　弁理士　須山　佐一

(54)【発明の名称】　真空成膜装置用部品とそれを用いた真空成膜装置、およびターゲット、バッキングプレート

(57)【要約】

【課題】　成膜工程中に真空成膜装置用部品、ターゲットおよびバッキングプレートに付着する成膜材料の剥離を安定かつ有効に防止する。配線膜等の不良発生原因となるパーティクルの混入を防止する。

【解決手段】　部品本体２と、部品本体２の表面に形成され、ガス残存量が10Torr・cc/g以下である溶射膜３とを具備する真空成膜装置用部品１である。真空成膜装置は、真空容器内に配置される基板ホルダ等の被成膜試料保持部と、被成膜試料保持部と対向して配置されるターゲット等の成膜源と、成膜源を保持するターゲット外周押えやセンタキャップ等の成膜源保持部と、防着部品とを具備する。これらのうち、被成膜試料保持部、成膜源保持部および防着部品から選ばれる少なくとも 1つを、上述した真空成膜装置用部品、ターゲットおよびバッキングプレートで構成する。



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【特許請求の範囲】

【請求項１】　真空成膜装置の構成部品であって、部品本体と、前記部品本体の表面に形成され、ガス残存量が10Torr・cc/g以下である溶射膜とを具備することを特徴とする真空成膜装置用部品。

【請求項２】　請求項１記載の真空成膜装置用部品において、

前記溶射膜は、溶射形成後に脱ガス処理が施されていることを特徴とする真空成膜装置用部品。

【請求項３】　請求項１記載の真空成膜装置用部品において、

前記溶射膜は、表面粗さが平均粗さで 5～50μm の範囲であると共に、厚さが50～ 500μm の範囲であることを特徴とする真空成膜装置用部品。

【請求項４】　請求項１記載の真空成膜装置用部品において、

前記溶射膜は、異なる材料からなる 2層以上の被膜を有することを特徴とする真空成膜装置用部品。

【請求項５】　請求項１記載の真空成膜装置用部品において、

前記溶射膜は、前記部品本体との熱膨張率の差が10×10^{-6}/K以下の金属材料からなることを特徴とする真空成膜装置用部品。

【請求項６】　真空容器と、前記真空容器内に配置される被成膜試料保持部と、前記真空容器内に前記被成膜試料保持部と対向して配置される成膜源と、前記成膜源を保持する成膜源保持部と、前記被成膜試料保持部または成膜源保持部の周囲に配置された防着部品とを具備する真空成膜装置において、

前記被成膜試料保持部、前記成膜源保持部および前記防着部品から選ばれる少なくとも 1つが、請求項１記載の真空成膜装置用部品からなることを特徴とする真空成膜装置。

【請求項７】　請求項６記載の真空成膜装置において、

前記真空成膜装置用部品の表面に形成された溶射膜は、前記成膜源を構成する少なくとも 1種の金属材料からなることを特徴とする真空成膜装置。

【請求項８】　ターゲット本体と、前記ターゲット本体の非エロージョン領域に形成され、ガス残存量が10Torr・cc/g以下である溶射膜とを具備することを特徴とするターゲット。

【請求項９】　ターゲットを保持するためのバッキングプレート本体と、前記バッキングプレート本体の表面に形成され、ガス残存量が10Torr・cc/g以下である溶射膜とを具備することを特徴とするバッキングプレート。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、スパッタリング装置やＣＶＤ装置等の真空成膜装置に用いられる真空成膜装置用部品、それを用いた真空成膜装置、ターゲットおよびバッキングプレートに関する。

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【０００２】

【従来の技術】半導体部品や液晶部品等においては、スパッタリング法やＣＶＤ法等の成膜方法を利用して各種の配線膜や電極を形成している。具体的には、半導体基板やガラス基板等の被成膜基板上に、スパッタリング法やＣＶＤ法等を適用してＡｌ、Ｔｉ、Ｍｏ、Ｗ、Ｍｏ－Ｗ合金等の導電性金属や$MoSi_2$、WSi_2等の導電性金属化合物の薄膜を形成し、配線膜や電極等として利用している。

【０００３】ところで、上記した配線膜等の形成に使用されるスパッタリング装置やＣＶＤ装置等の真空成膜装置では、Ｓｉ基板やガラス基板上への成膜工程中に、装置内に配置されている各種部品にも成膜材料が付着、堆積することが避けられない。このような部品上に付着、堆積した成膜材料は、成膜工程中に部品から剥離することにって、ダストの発生原因となっている。このようなダストが成膜基板上の膜中に混入すると、配線形成後にショートやオープン等の配線不良を引き起こし、製品歩留りの低下を招くことになる。

【０００４】このようなことから、従来の真空成膜装置においては、例えば表面が凹凸形態のＣｕシート等を部品表面に貼付け、付着物の密着力を向上させることにより付着した成膜材料の剥離を防止する等のダスト防止対策が採られている。また、特開昭 63-238263号公報には、成膜装置の構成部品の全部または一部を成膜材料と同一材料で形成し、部品と成膜材料との熱膨張差に基く剥れを防止することが提案されている。

【０００５】

【発明が解決しようとする課題】上述した従来のダスト防止対策のうち、Ｃｕシート等を貼り付ける方法は、部品の形状変化の大きな部分や複雑に変化しているような箇所には連続的に貼付けることが不可能であるため、Ｃｕシートを切断して不連続にスポット溶接等で部品に貼り付けている。このため、Ｃｕシートが無い部分が存在したり、また平滑な切断面が露出し、このような部分に成膜材料が付着すると容易に剥れが発生するため、ダストを十分に防止することはできない。

【０００６】さらに、スパッタリング装置において、成膜材料となるターゲットの周辺部品にＣｕシートを適用した場合、プラズマの影響によりＣｕシートが同時にスパッタされて膜中に不純物として取り込まれるおそれがあることから、成膜源となるターゲットの周辺には使用することができず、従って成膜材料が付着する全ての部品にＣｕシートを適用することはできないという欠点がある。

【０００７】一方、成膜装置構成部品の全部または一部を成膜材料と同一材料で形成する場合、部品全部を成膜材料で形成すると、部品強度等の特性低下を招いたり、また部品コストが増大する等の問題がある。また、部品

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表面に成膜材料の膜を形成する場合、その成膜方法によっては膜自体が剥れる等の問題がある。

【0008】特に、最近の半導体素子においては、 16M、 64M、256Mというような高集積度を達成するために、配線幅を 0.5μm 、さらには 0.3μm というように、極めて狭小化することが求められている。このように狭小化された配線においては、例えば直径 0.3μm 程度の極微小粒子（微小パーティクル）が混入しても配線不良を引起こすことになる。また、配線幅の狭小化は当然ながら配線密度の高密度化のためであり、このような高密度配線を有する半導体素子等の製造歩留りを高めるためには、パーティクルの発生量自体も大幅に低減する必要がある。

【0009】このような極めて過酷な条件に対して、上述したような従来のダスト防止対策（パーティクル防止対策）では、上記した基本的な問題を除いたとしても十分に対応することはできず、高集積化された半導体素子等の製造歩留りは極めて低いのが現状である。

【0010】また、特開昭61-87861号公報には、部品からのガス放出量を低減するために、部品表面にＡｌ等の溶射膜を形成することが記載されている。このＡｌ等の溶射膜は、パーティクルの発生防止等を目的としていないだけでなく、単なる溶射膜をパーティクルの発生防止対策として利用したとしても十分な効果は得られず、さらに単なる溶射膜は短期間で剥離しやすいという欠点を有している。

【0011】さらに、上記のような問題は成膜装置構成部品に限らず、例えばスパッタリング法等の成膜源であるターゲット、あるいはこのターゲットを冷却保持するためのバッキングプレートにおいても上記成膜装置構成部品と同様の問題が発生している。

【0012】本発明は、このような課題に対処するためになされたもので、成膜工程中に付着する成膜材料の剥離を安定かつ有効に防止することを可能にした真空成膜装置用部品、ターゲットおよびバッキングプレート、さらには配線膜等の不良発生原因となるダストやパーティクルの混入を防止し、高集積化された半導体素子用の配線膜形成等への対応を図った真空成膜装置、ターゲットおよびバッキングプレートを提供することを目的としている。

【0013】

【課題を解決するための手段】本発明者らは、真空成膜装置の構成部品、ターゲットおよびバッキングプレートからの付着物の剥離による微小パーティクルの発生を極力抑制するために種々検討した結果、付着物の内部応力を吸収して応力を低減することが付着物の剥離抑制に効果を示し、また溶射法で形成した被膜が良好な応力低減効果を有することを見出した。

【0014】しかし、溶射は通常大気中で行われるため、溶射膜中にはガス、水分等が含まれ、さらに溶射膜

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の表面には酸化膜等が生成している。このような溶射膜を有する部品等を真空成膜装置内に組込んで使用すると、部品からガス成分が放出されて真空度が上らないだけでなく、ガス成分の放出や表面酸化膜等に起因して付着物の剥離が起こり、新たにパーティクルの発生を誘発することになる。また、腐食性雰囲気中で部品を使用した場合、溶射膜自体が腐食してパーティクルの発生を引き起こす。このような点を改善するためには、溶射法により被膜を形成した後に、真空中または水素雰囲気中で加熱処理して脱ガスを実施することが効果的であることを見出した。

【0015】本発明は上述したような知見に基いて成されたものであって、本発明の真空成膜装置用部品は、請求項１に記載したように、真空成膜装置の構成部品であって、部品本体と、前記部品本体の表面に形成され、ガス残存量が10Torr・cc/g以下である溶射膜とを具備することを特徴としている。また、特に請求項３に記載したように、前記溶射膜は表面粗さが平均粗さで 5～50μm の範囲であると共に、厚さが50～ 500μm の範囲であることを特徴としている。

【0016】また、本発明の真空成膜装置は、請求項６に記載したように、真空容器と、前記真空容器内に配置される被成膜試料保持部と、前記真空容器内に前記被成膜試料保持部と対向して配置される成膜源と、前記成膜源を保持する成膜源保持部と、前記被成膜試料保持部または成膜源保持部の周囲に配置された防着部品とを具備する真空成膜装置において、前記被成膜試料保持部、前記成膜源保持部および前記防着部品から選ばれる少なくとも 1つが、上述した本発明の真空成膜装置用部品からなることを特徴としている。

【0017】さらに、本発明のターゲットは、請求項８に記載したように、ターゲット本体と、前記ターゲット本体の非エロージョン領域に形成され、ガス残存量が10Torr・cc/g以下である溶射膜とを具備することを特徴としている。また、本発明のバッキングプレートは、請求項９に記載したように、ターゲットを保持するためのバッキングプレート本体と、前記バッキングプレート本体の表面に形成され、ガス残存量が10Torr・cc/g以下である溶射膜とを具備することを特徴としている。

【0018】

【発明の実施の形態】以下、本発明の実施形態について説明する。

【0019】図1は、本発明の真空成膜装置用部品の一実施形態の要部構成を示す断面図である。同図に示す真空成膜装置用部品１は、部品本体（基材）２の表面に溶射膜３が設けられている。なお、部品本体２の構成材料は特に限定されるものではないか、例えば装置部品の構成材料として一般的なステンレス材等を用いることができる。また、部品本体２の溶射膜形成面２ａは、アンカー効果が得られるように、予めブラスト処理等であらし

ておくことが好ましい。

【0020】上記した溶射膜３は、プラズマ溶射法、ガス溶射法、アーク溶射法等の各種溶射法を適用して形成することができ、部品本体２の構成材料や形状、あるいは溶射材料（被膜材料）等に応じて適宜選択して使用する。溶射膜３は部品本体２に対する密着力に優れるものであるが、成膜工程中の温度上昇に基く部品本体２と溶射膜３との界面からの剥離等を防止する上で、部品本体２との熱膨張率の差が10×10^{-6}/K以下の金属材料で溶射膜３を形成することが好ましい。

【0021】また、溶射膜３上に付着する成膜材料（付着物）の熱膨張差による剥離を防止する上で、溶射膜３の形成材料は成膜材料との熱膨張率の差も10×10^{-6}/K以下であることが好ましい。成膜材料との関係のみを考えた場合には、溶射膜３は成膜材料と同一材料、また成膜する膜が合金膜や化合物膜等の場合には、成膜材料（成膜源）を構成する少なくとも 1種の金属材料で形成することが望ましい。このような条件を満足させることによって、溶射膜３上に付着した成膜材料の熱膨張差に基く剥離を防止することができる。

【0022】このような溶射膜３は、成膜工程中に付着、堆積した成膜材料（付着物）の剥離防止膜として機能する。ここで、真空成膜装置用部品１の表面には、成膜工程中に成膜材料が付着して堆積するが、部品表面がある程度の凹凸状態であるならば、この付着物の厚さが20～60μm 程度までは剥離を生じない。しかし、これ以上になると付着物は容易に剥離する傾向が認められる。これは付着物に内部応力が作用し、厚さが増加するに伴って内部応力が大きくなり、この内部応力の増加に基いて付着物の剥離が発生する。従って、付着物の剥離を防止するためには、付着物の内部応力を吸収して応力を低減する必要がある。上記した溶射膜３は、気孔を多数含む内部構造等により付着物の内部応力を吸収する作用を有し、良好な付着物の応力低減効果を発揮するものである。

【0023】ただし、単に溶射形成した膜はガス、水分等を含み、さらに膜表面には酸化膜等が生成している。これらはパーティクルの発生原因、膜寿命の低下要因、真空度の低下要因等となるため、溶射で被膜を形成した後に、真空中や水素雰囲気中で加熱処理を行う等によって脱ガス処理を施し、大気中溶射で被膜中に混入したガスや水分等を除去することが好ましい。

【0024】すなわち、上述した溶射膜３は溶射形成後に脱ガス処理等を施すことにより、ガス残存量が10Torr・cc/g以下とされている。溶射膜３中のガス残存量が10Torr・cc/gを超えると、ガス成分の放出や溶射膜の腐食等に起因して付着物の剥離が起ったり、さらには溶射膜自体の剥離等が生じる。言い換えると、ガス残存量が10Torr・cc/g以下の溶射膜３によれば、ガス成分の放出や腐食等が防止でき、その上で上述した応力低減効果が十分に発揮されるため、付着物の剥離を安定かつ有効に防止することができる。溶射膜３のガス残存量はより良好な効果を得る上で 5Torr・cc/g以下とすることが望ましい。

【0025】ここで、図２はステンレス材(SUS 304) の表面にW溶射膜を大気中溶射で形成した後、水素中、 1223K×1hの条件で脱ガス処理を行った溶射脱ガス部品の加熱処理に伴うガス放出量を、脱ガス処理を行っていない溶射部品と共に測定した結果である。なお、ガス放出試験は特定の真空中で常温から773Kまで 1時間で加熱後、 1時間保持する間の放出されるガス量を加熱および保持時の真空度の低下から測定した値を確認することにより実施した。図２から明らかなように、脱ガス処理を行った溶射脱ガス部品はガス放出量が大幅に低減していることが分かる。なお、ここで言うガス残存量とは、特定の真空中で常温から773Kまで 1時間で加熱後、 1時間保持して放出される総ガス量を加熱後の真空度の低下から測定した値を指すものとする。また、溶射膜３のガス残存量は、例えば減圧溶射等を適用することによって、脱ガス処理を行うことなく低減することも可能であるが、加熱処理等による脱ガス処理は表面酸化被膜の除去効果等をも有するため、溶射形成後に実施することが望ましい。

【0026】上述した脱ガス処理としての加熱処理は、溶射膜３としてWやＭｏ等の高融点金属を用いる場合には、溶射後に溶射膜表面が酸化被膜で覆われているため、水素中等の還元雰囲気中で行うことが好ましく、これにより表面酸化被膜を除去することができる。表面酸化被膜が残存していると、付着物が剥離し易くなるために完全に除去することが望ましい。従って、例えば水素還元処理は真空排気後に水素気流中で実施することが好ましい。また処理温度は、部品本体２の構成材料がステンレスの場合には1073～ 1373K程度とすることが好ましい。処理温度が1073K未満では例えば水素還元効果が十分に得られないおそれがあり、一方1373K を超えると部品本体２が熱変形等を起こすおそれがある。

【0027】また、溶射膜３をＴｉやＡｌ等の水素脆化し易い材料で形成する場合には、真空中で加熱処理を行うことが好ましく、その際の処理温度は 573～773K程度とすることが好ましい。この際の処理温度が573K未満であると十分なガス放出効果が得られないおそれがあり、一方773Kを超えると溶射膜３が軟化して剥離し易くなるおそれがある。

【0028】溶射膜３は、その形成過程に基いて複雑な表面形態を有することから、付着物に対して良好な密着性を示す。特に、溶射膜３の表面粗さが平均粗さR_aで 5～50μm の範囲である場合に優れた付着物の剥離防止効果が得られる。すなわち、溶射膜３の表面平均粗さR_aが 5μm 未満であると、付着物が容易に剥離するおそれが大きく、一方50μm を超えると溶射膜３表面の凹凸

が大きくなり過ぎて、付着物が溶射膜３全体に付着せずに空孔が残るため、そこを起点として付着物の剥離が起るおそれがある。溶射膜３の表面粗さは平均粗さで10～15μm の範囲とすることがさらに好ましい。

【００２９】また、溶射膜３による付着物の剥離防止効果を得る上で、上述した表面粗さと共に溶射膜３の膜厚を適度に調整することが重要であり、このような点から溶射膜３の膜厚は50～ 500μm の範囲とすることが好ましい。すなわち、溶射膜３は前述したように付着物の内部応力を低減する効果を有しているが、この応力低減効果は厚さによりその程度が異なり、溶射膜３の厚さが50μm 未満であると上記応力低減効果が低下して付着物が剥れ易くなる。一方、 500μm を超えると溶射膜３自体に大きな内部応力が発生し、これに付着物の内部応力が加わって剥離が発生し易くなる。溶射膜３の膜厚は、上記した効果がより良好に得られる 100～300μm の範囲とすることがさらに好ましい。

【００３０】溶射膜３は単一材料による被膜に限らず、例えば異なる材料からなる 2層以上の被膜で溶射膜３を構成してもよい。 2層以上の溶射膜３の具体的な構成としては、例えば部品形状が大きく変化する屈曲部や湾曲部等の溶射膜３が剥れやすい部位に、予め部品本体２に対して密着性の高い第１の溶射膜を形成し、その上に付着物に対する密着性の高い第２の溶射膜を形成するような構成、あるいは表面側に耐食性に優れた溶射膜を形成する構成等が挙げられる。さらに、部品本体２と成膜材料との熱膨張差が極端に異なる場合、これらの熱膨張差を緩和するように、熱膨張率が異なる 2層以上の溶射膜を順に形成してもよい。 2層以上の溶射膜３を適用する場合、それらの間の熱膨張差は溶射膜３と部品本体２や成膜材料との熱膨張差と同様に10×10^{-6}/K以下とすることが好ましい。

【００３１】上述したような本発明の真空成膜装置用部品は、スパッタリング装置やＣＶＤ装置等の真空成膜装置の構成部品として用いられるものであり、成膜工程中に成膜材料が付着する部品であれば、種々の部品に対して適用可能である。具体的な構成については、以下の真空成膜装置の実施形態で説明する。

【００３２】また、上記の発明の実施形態の説明においては、真空成膜装置用部品について説明したが、上記内容はターゲット本体とこのターゲット本体の非エロージョン領域に形成されたガス残存量が10Torr・cc/g以下である溶射膜とを具備するターゲット、あるいはターゲットを保持するためのバッキングプレート本体とこのバッキングプレート本体の表面に形成されたガス残存量が10Torr・cc/g以下である溶射膜とを具備するバッキングプレートにおいても同様に適用できる。すなわち、上記した真空成膜装置用部品で説明した、溶射膜のガス残存量、熱膨張率、脱ガス処理の条件、表面粗さ、膜厚および 2層以上の構成は、ターゲット本体の非エロージョン領域に形成される、あるいはターゲットを冷却保持するためのバッキングプレート本体の表面に形成される、ガス残存量が10Torr・cc/g以下である溶射膜においても同様に適用可能である。

【００３３】次に、本発明の真空成膜装置の実施形態について説明する。図３は本発明の真空成膜装置をスパッタリング装置に適用した一実施形態の要部構成を示す図であり、１１はバッキングプレート１２に固定されたターゲットであり、この成膜源であるターゲット１１は、成膜源保持部として機能するリング状のターゲット外周押え１３およびセンタキャップ１４により保持されている。また、ターゲット１１の外周部下方には、アースシールド１５が設けられており、その下方外周部側には上部防着板１６が配置されている。

【００３４】被成膜試料である基板１７はターゲット１１と対向配置するように、被成膜試料保持部であるプラテンリング１８および基板ホルダ１９によって保持されている。基板ホルダ１９の外周部側には下部防着板２０が配置されている。これらは図示を省略した真空容器内に配置されており、真空容器にはスパッタガスを導入するためのガス供給系（図示せず）と真空容器内を所定の真空状態まで排気する排気系（図示せず）とが接続されている。なお、図中２１は磁場コイルである。この実施形態のスパッタリング装置においては、ターゲット外周押え１３、アースシールド１５、プラテンリング１８および基板ホルダ１９を、上述した本発明の真空成膜装置用部品、すなわち表面にガス残存量が10Torr・cc/g以下の溶射膜３が設けられた真空成膜装置用部品１で構成している。真空成膜装置用部品１の具体的な構成は前述した通りである。また、この実施形態においては、ターゲット１１およびバッキングプレート１２を、ターゲット１１の非エロージョン領域およびバッキングプレート１２の表面に、ガス残存量が10Torr・cc/g以下の溶射膜３を設けたもので構成している。ターゲット１１およびバッキングプレート１２の構成は前述した通りである。なお、溶射膜３はターゲット１１からスパッタされた粒子が付着する面に形成されている。

【００３５】このようなスパッタリング装置においては、成膜工程中にターゲット外周押え１３、アースシールド１５、プラテンリング１８、基板ホルダ１９、ターゲット１１およびバッキングプレート１２等の表面にスパッタされた成膜材料（ターゲット１１）が付着するが、この付着物の剥離は部品表面の溶射膜３により安定かつ有効に防止される。また、溶射膜３自体も安定で長寿命である。これらによって、ダストおよびパーティクルの発生量、さらには基板１７に形成される膜中への混入量を大幅に抑制することができる。従って、 16M、 64M、256Mというような高集積度の半導体素子の配線膜、すなわち配線幅が 0.5μm 以下というように狭小で、かつ高密度の配線網を形成する配線膜であっても、微小パ

ーティクル（例えば直径 0.2μm 以上）の混入を大幅に抑制できることから、配線不良を大幅に低減することが可能となる。

【0036】なお、上記実施形態においては、ターゲット外周押え１３、アースシールド１５、プラテンリング１８、基板ホルダ１９、ターゲット１１およびバッキングプレート１２を本発明で構成した例について説明したが、これら以外にセンタキャップ１４、上部防着板１６、下部防着板２０等を本発明の真空成膜装置用部品で構成することも有効である。さらに、これら以外の部品についても、成膜工程中に成膜材料の付着が避けられない部品であれば、本発明の真空成膜装置用部品は有効に機能する。このように、本発明の真空成膜装置は被成膜試料保持部、成膜源保持部、防着部品等から選ばれる少なくとも 1つを、本発明の真空成膜装置用部品で構成することによって、さらにはターゲットやバッキングプレートに本発明を適用することによって、上述したような優れた効果を得ることができる。

【0037】本発明の真空成膜装置用部品における溶射膜は、上述したように装置構成部品以外、具体的にはターゲットに対しても有効に機能する。すなわち、ターゲットの外周部分は実質的にはスパッタされず、このような非エロージョン領域にもスパッタされた粒子が付着する。このようなターゲット外周部の付着物が剥離しても、他の部品からの付着物の剥離と同様に配線膜等の不良原因となる。従って、実質的にスパッタされないターゲットの非エロージョン領域に、本発明による溶射膜を予め形成しておくことによって、付着物の剥離に伴う配線不良等が防止できる。

【0038】また、上記実施形態では本発明の真空成膜装置をスパッタリング装置に適用した例について説明したが、これ以外に真空蒸着装置（イオンプレーティングやレーザーアブレーション等を含む）、ＣＶＤ装置等の真空成膜装置にも適用可能であり、上述したスパッタリング装置と同様な効果を得ることができる。

【0039】

【実施例】次に、本発明の具体的な実施例について説明する。

【0040】実施例1

図3に示したスパッタリング装置のターゲット外周押え１３、アースシールド１５、プラテンリング１８、基板ホルダ１９、上部防着板１６および下部防着板２０として、 SUS 304製基材の表面にプラズマ溶射法で厚さ 200μm のＴｉ溶射膜３を形成した後、真空中にて576K×1hの加熱処理を行って脱ガス処理した部品を使用し、マグネトロンスパッタリング装置を構成した。脱ガス処理後のＴｉ溶射膜中のガス残存量は 0.9Torr・cc/gであり、またＴｉ溶射膜の表面粗さは平均粗さR_aで12μm であった。

【0041】このマグネトロンスパッタリング装置に高純度Ｔｉターゲットをセットし、マグネトロンスパッタリングを行って、 6インチウェーハ上にＴｉとN_2ガスの導入によりＴｉＮ薄膜を形成した。このようにして得たＴｉＮ薄膜上の直径 0.3μm 以上のパーティクル（ダスト）数を測定した。このような操作を連続して行い、パーティクル数の変化を調査した。その結果を図4に示す。

【0042】また、本発明との比較例として、上記実施例と同様な各部品として、 SUS 304製基材の表面にプラズマ溶射法で厚さ 200μm のＴｉ溶射膜を形成し、これを脱ガス処理をせずに部品として用いて、マグネトロンスパッタリング装置を構成した。このマグネトロンスパッタリング装置を真空排気したところ、部品からの放出ガス量が多くスパッタリングが実施できない状態となり、チャンバを長時間ベーキングしてはじめてスパッタリングが行える真空度まで到達した。次に、上記実施例１と同様にしてＴｉＮ薄膜上のパーティクル数の変化を調べた。その結果を図４に併せて示す。

【0043】図4から明らかなように、実施例1によるマグネトロンスパッタリング装置はパーティクル発生量が2000チャージまで安定して少ないのに対して、比較例１によるマグネトロンスパッタリング装置では当初からパーティクル発生量が多く、さらには 800チャージ程度でＴｉ溶射膜の剥れに起因したパーティクルの増加が認められた。これらから、実施例の処理によりパーティクルの発生を有効かつ安定して防止できることが確認された。

【0044】実施例2

図3に示したスパッタリング装置のターゲット外周押え１３、アースシールド１５、プラテンリング１８、基板ホルダ１９、上部防着板１６および下部防着板２０として、 SUS 304製基材の表面に、まずプラズマ溶射法で厚さ50μm のＮｉ－Ｔｉ合金溶射膜を形成し、続いて厚さ 150μm のＴｉ溶射膜を形成した後、真空中にて573K×1hの加熱処理を行った脱ガス処理した部品を用いて、マグネトロンスパッタリング装置を構成した。脱ガス処理後の溶射膜中のガス残存量は 1Torr・cc/gであり、また最表面のＴｉ溶射膜の表面粗さは平均粗さで15μm であった。

【0045】このマグネトロンスパッタリング装置に高純度Ｔｉターゲットをセットし、マグネトロンスパッタリングを行って、実施例１と同様にしてパーティクル（ダスト）数の変化を調べた。その結果、実施例１と同様に、パーティクル発生量は2000チャージ程度まで安定して少なかった。また、この実施例２の処理の場合、屈曲部等に対する溶射膜の安定性も高く、そのような部分での剥れも発生せず、極めて良好な結果が得られた。

【0046】実施例3

図３に示したスパッタリング装置のターゲット外周押え１３、アースシールド１５、プラテンリング１８、基板

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ホルダ１９、上部防着板１６および下部防着板２０として、 SUS 304製基材の表面にプラズマ溶射法で厚さ 200μm のW溶射膜を形成した後、水素中にて 1273K×1hの加熱処理を行って脱ガス処理した部品を用い、マグネトロンスパッタリング装置を構成した。脱ガス処理後のW溶射膜中のガス残存量は 2.6Torr・cc/gであり、またW溶射膜の表面には酸化被膜が存在せず、その表面粗さは平均粗さで 8μm であった。

【００４７】このマグネトロンスパッタリング装置にＭｏ－Ｗターゲットをセットし、マグネトロンスパッタリングを行って、実施例１と同様にしてパーティクル（ダスト）数の変化を調べた。その結果、パーティクル発生量は1500チャージ程度まで安定して少なかった。また、その発生量自体も脱ガス処理していないW溶射部品（比較例２）を用いた場合に比べて 1/3程度であった。

【００４８】実施例4

図3に示したスパッタリング装置のターゲット外周押え１３、アースシールド１５、プラテンリング１８、基板ホルダ１９、上部防着板１６および下部防着板２０として、 SUS 304製基材の表面にアーク溶射法で厚さ 250μm のＡｌ溶射膜を形成した後、真空中にて623K×1hの加熱処理を行って脱ガス処理した部品を用いて、マグネトロンスパッタリング装置を構成した。脱ガス処理後のＡｌ溶射膜中のガス残存量は 3.2Torr・cc/gであり、またＡｌ溶射膜の表面粗さは平均粗さで25μm であった。

【００４９】このマグネトロンスパッタリング装置に高純度タングステンシリサイド（ＷＳｉ$_{2.8}$ ）ターゲットをセットし、マグネトロンスパッタリングを行って、実施例１と同様にしてパーティクル（ダスト）数の変化を調べた。その結果、実施例１と同様に、パーティクル発生量は2000チャージ程度まで安定して少なかった。また、その発生量自体も脱ガス処理していないＡｌ溶射部品（比較例３）を用いた場合に比べて 1/2程度であった。

【００５０】比較例4

図3に示したスパッタリング装置のターゲット外周押え１３、アースシールド１５、プラテンリング１８、基板ホルダ１９、上部防着板１６および下部防着板２０として、 SUS 304製基材の表面に、ＣＶＤ法で厚さ20μm のW膜（比較例４）を形成した後、真空中にて773K× 1hr の加熱処理を行って脱ガス処理した部品を用い、マグネトロンスパッタリング装置を構成した。W膜の表面粗さは平均粗さで 0.5μm であった。

【００５１】このマグネトロンスパッタリング装置に高純度タングステンシリサイド（ＷＳｉ$_{2.8}$ ）ターゲットをセットし、マグネトロンスパッタリングを行って、実施例１と同様にしてパーティクル（ダスト）数の変化を調べたところ、35チャージ程度で部品表面のタングステンシリサイド膜の剥離が生じ、パーティクル（ダスト）数が大幅に増加した。

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【００５２】実施例5

図3に示したスパッタリング装置のターゲット外周押え１３、アースシールド１５、プラテンリング１８、基板ホルダ１９、上部防着板１６および下部防着板２０として、 SUS 304製基材の表面にプラズマ溶射法で厚さ 250μm のＴｉ溶射膜を形成した。また、ターゲット１１として高純度Ｔｉを使用し、またバッキングプレート１２にＣｕを使用し、この高純度Ｔｉターゲット１１の外周部の非エロージョン領域およびＣｕバッキングプレート１２の表面にも、同様にプラズマ溶射法で厚さ 250μm のＴｉ溶射膜を形成した。

【００５３】これらＴｉ溶射膜を形成した各部品、ターゲットおよびバッキングプレートを真空中で575K×1hの加熱処理を行って脱ガス処理し、これら脱ガス処理したものを用いて、マグネトロンスパッタリング装置、ターゲットおよびバッキングプレートを構成した。脱ガス処理後のＴｉ溶射膜中のガス残存量は 1.2Torr・cc/gであり、またＴｉ溶射膜の表面粗さは平均粗さで17μm であった。

【００５４】上記したマグネトロンスパッタリング装置に、上記Ｃｕバッキングプレート１２に保持された高純度Ｔｉターゲット１１をセットした後、マグネトロンスパッタリングを行って、実施例１と同様にしてパーティクル（ダスト）数の変化を調べた。その結果、ターゲットおよびバッキングプレートに溶射しない場合と比較して、突発的に発生するパーティクルがなくなり、全体のパーティクル数は半減し、パーティクル発生を有効かつ安定して防止できることが確認できた。

【００５５】

【発明の効果】以上説明したように、本発明の真空成膜装置用部品によれば、成膜工程中に付着する成膜材料の剥離を安定かつ有効に防止することが可能となる。従って、そのような真空成膜装置用部品を用いた本発明の真空成膜装置によれば、パーティクルの発生量を大幅に低減でき、配線膜等の不良発生原因となる膜中へのパーティクルの混入が抑制することが可能となる。また、真空成膜装置のクリーニング回数を減らすことができるため、ランニングコストの削減が可能となる。このような本発明の真空成膜装置、ターゲットおよびバッキングプレートは、高集積化された半導体素子の配線膜形成等に好適である。

【図面の簡単な説明】

【図１】 本発明の一実施形態による真空成膜装置用部品の要部構成を示す断面図である。

【図２】 本発明の真空成膜装置用部品の加熱下におけるガス放出量を脱ガス処理を施していない溶射部品および部品素材と比較して示す図である。

【図３】 本発明の真空成膜装置を適用したスパッタリング装置の一実施形態の要部構成を示す断面図である。

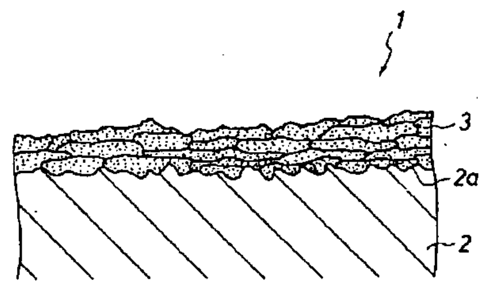
【図４】 本発明の実施例１によるスパッタリング装置

を使用した際のパーティクル数の変化を脱ガス処理を施していない溶射部品を用いたスパッタリング装置と比較して示す図である。

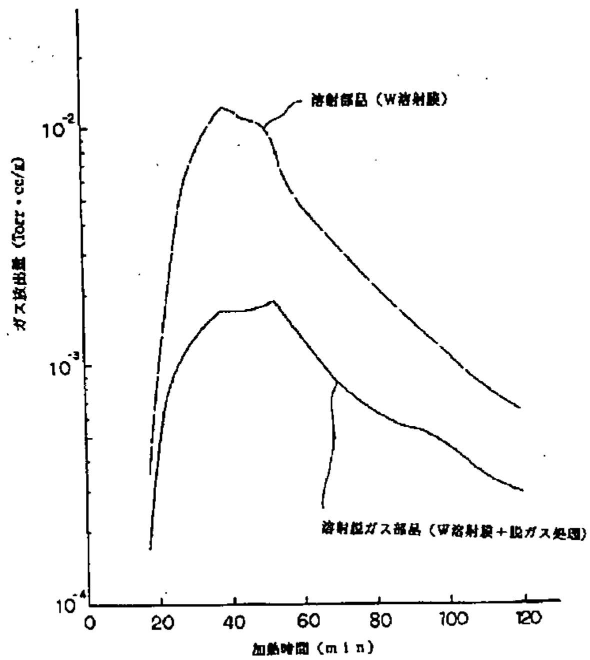
【符号の説明】

1………真空成膜装置用部品
2………部品本体（基材）
3………溶射膜
11……ターゲット
12……バッキングプレート
13……ターゲット外周押え
14……センタキャップ
15……アースシールド
16、20……防着板
17……被成膜基板
18……プラテンリング
19……基板ホルダ

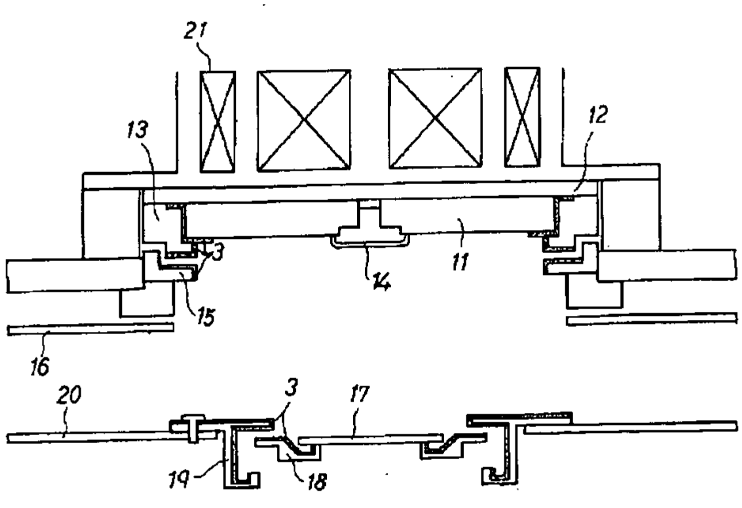
【図1】



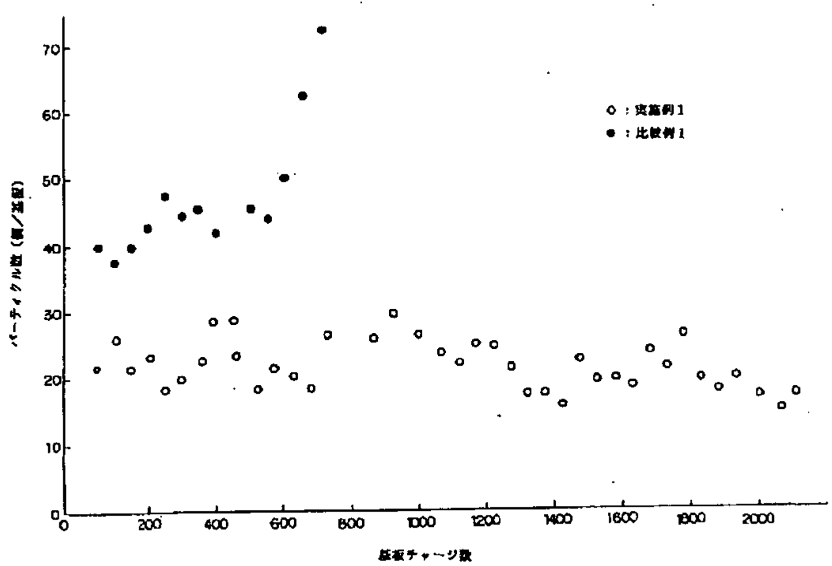
【図2】



【図3】



【図4】



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